

CTENOPONTONIA CYPHASTREOPHILA, A NEW GENUS AND SPECIES OF CORAL ASSOCIATED PONTONIINE SHRIMP FROM ENIWETOK ATOLL

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ABSTRACT

A pair of pontoniine shrimps, representing an undescribed species of a new genus, *Ctenopontonia cyphastreophila*, are described and illustrated. The specimens are remarkable for the pectinate armament of the orbital margin and the absence of flagellate exopods on the maxillipeds. They appear most closely related to the species of *Pontonides* Borradaile. They are associates of the faviid coral *Cyphastrea microphthalmia* (Lam.) and inhabit a small network of fissures on the surface of the host's skeleton, a feature that has not been reported with any other shrimps. The specimens were obtained from shallow sublittoral water at Eniwetok Atoll, Marshall Islands.

Numerous pontoniine and other shrimps have been reported as associates of Indo-West Pacific branching corals, particularly the species of the genera *Pocillopora*, *Stylophora*, *Seriatopora*, and *Acropora*. Other branching corals also harbor several species, but comparatively few have been found in association with the numerous massive unbranched corals. The discovery of a pair of specimens of an undescribed genus on a faviid coral on Eniwetok Atoll is therefore of special interest. I am most grateful to Mrs. A. Fielding and Dr. D. M. Devaney for the opportunity to examine and report upon these specimens, and to Dr. J. E. N. Veron, for the identification of the host coral.

Ctenopontonia new genus

A small shrimp, with a strongly compressed body form. Carapace and abdomen smooth. Rostrum well developed, with broad lateral carinae, lacking dorsal and ventral carinae, and without teeth. Epigastric spine present, hepatic and supra-orbital spines lacking. Orbit well developed, with 20-23 acute spines along margin. Abdominal pleura rounded. Telson normal. Eyes well developed. Antennae normal, stylocerite reduced, scaphocerite large. Epistome unarmed. Mandible with large broad incisor process, greatly reduced molar process and without palp. Maxillula without lower lacinia (?), palp bilobed. Maxilla without endites, scaphognathite normal. All maxillipeds without flagellate exopods. First maxilliped with normal caridean lobe, basal and coxal endites fused, palp simple, epipod large, not bilobed. Second maxilliped with elongated epipod; no podobranch. Third maxilliped with small rounded epipod, and rudimentary lamellar arthrobranch. Fourth thoracic sternite unarmed. First pereopods normal, fingers simple. Second pereopods small, robust, similar, subequal. Ambulatory pereopods short and stout, dactylus robust and simple. Uropods normal.

Type species.—*Ctenopontonia cyphastreophila* new species

Systematic Position of Genus.—The features of particular importance in assessing the systematic relationships of this genus are: (1) the form of the rostrum and orbit, (2) presence of epigastric and absence of supraorbital and hepatic spines, (3) well developed scaphocerite, (4) the form of mandible, (5) absence of endites on the maxilla, (6) the absence of flagellate exopods on all maxillipeds, (7) the

small subequal second pereopods, (8) the stout, curved simple dactyls on the ambulatory pereopods, (9) the rounded pleura and (10) the normal caudal fan.

The presence of these features shows that *Ctenopontonia* is most closely related to *Pontonides* Borradaile 1917. At present 14 genera of pontoniine shrimp, in addition to *Ctenopontonia*, are known to have some maxillipeds without flagella. Twelve genera are at present also known in which exopods are lacking from both the second and third maxillipeds. Of these, five are also without or with only a rudiment of a flagellum on the exopod on the first maxilliped. The results are summarized below:

Genus	Mxp I*	Mxp II	Mxp III
1. <i>Ctenopontonia</i> gen. nov.	—	—	—
2. <i>Hamodactyloides</i> Fujino, 1973	—	—	—
3. <i>Pontonides</i> Borradaile, 1917	r	—	—
4. <i>Pseudocoutierea</i> Holthuis, 1951	—	—	—
5. <i>Veleronia</i> Holthuis, 1951	—	—	—
6. <i>Anchistioides</i> Paulson, 1875	r	—	—
7. <i>Hamodactylus</i> Holthuis, 1952	+	—	—
8. <i>Balssia</i> Kemp, 1922	+	—	—
9. <i>Neopontonides</i> Holthuis, 1951	+	—	—
10. <i>Lipkebe</i> Chace	+	—	—
11. <i>Waldola</i> Holthuis, 1951	+	—	—
12. <i>Paratypoon</i> Balss	+	—	—
13. <i>Coutierea</i> Nobili, 1901	?	—	—
14. <i>Mesopontonia</i> Bruce	+	+	—
15. <i>Propontonia</i> Bruce	+	+	—

(Caridean lobe present, flagellum absent.)

The genus *Ctenopontonia* may be readily separated from *Pontonides* by the absence of a dorsal rostral carina, the presence of an epigastric spine, the well-developed orbit with a multispinose dorsal and lateral margin, the feebly developed molar process and broad scoop-shaped incisor process of the mandible, the elongate upper lacinia with a minutely tuberculate lower border of the maxillula, the lack of endites on the maxilla, the feeble development of the endites of the first maxilliped and the presence of a vestigial arthrobranch on the third maxilliped. In the general features of the antennae, pereopods, pleopods, and caudal fan, there is a close resemblance to *Pontonides*, but there is no evidence of the specialized setae found on the ischium of the second pereopods or on the basis of the second and third maxillipeds in members of that genus.

Less important differences between *Ctenopontonia* and *Pontonides* are in the dentition of the incisor and molar processes of the mandible. In *Ctenopontonia* the incisor process on one side has numerous minute, slender acute teeth and on the other numerous short, stout, blunt teeth. In *Pontonides*, as in most other pontoniine shrimps, the incisor process is comparatively narrow with 3–4 distal teeth, of which the central 1–2 are smaller than the outer teeth. The molar process in *Pontonides* is robust, with distinct teeth distally, quite unlike the molar process in *Ctenopontonia*, which is greatly reduced and bears only a few tessellate setae, merging with some longer setae. The endites of the first maxilliped in *Pontonides* extend well beyond the tip of the palp. In *Ctenopontonia* they scarcely exceed the base of the palp, and the caridean lobe arches over anteriorly around the distal margin of the basal endite. In *Pontonides* the epipod is clearly bilobed. In *Ctenopontonia* it is simple and appears broadly attached rather than arising from a slender peduncle. In the second maxilliped in *Pontonides* the distal segment is

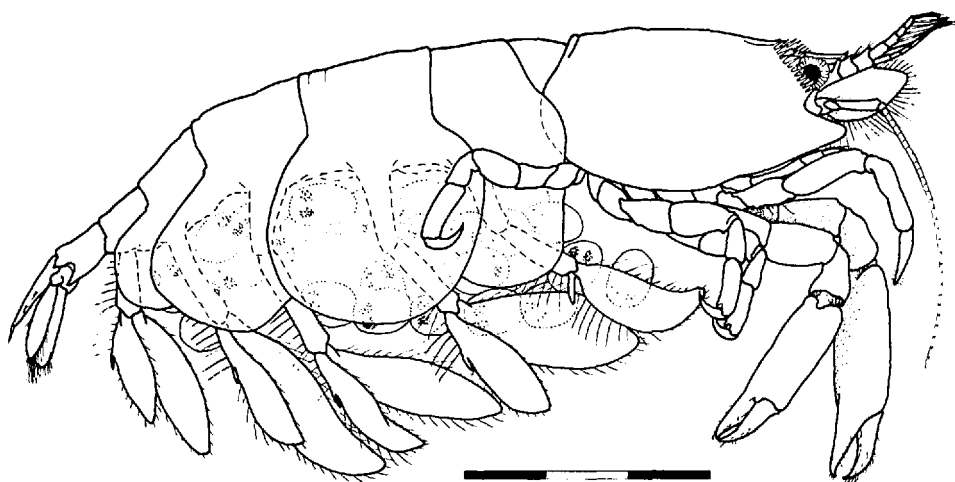


Figure 1. *Ctenopontonia cyphastreophila* new genus, new species. Ovigerous female holotype.

well developed with a deep concavity in the medial margin. In *Ctenopontonia* this segment is markedly reduced and the medial border strongly convex. The epipod in *Pontonides* is elongated and broad, in contrast to the long and slender form in *Ctenopontonia*.

Although most of the pontoniine shrimps that lack exopods on the maxillipeds are known to associate with coelenterates, none have been recorded in association with scleractinian corals, except for *Pontonides maldivensis* (Borr.) on *Dendrophyllia micracantha* (Ehrenberg) (Bruce, 1977) and *P. unciger* Calman on *D. ijimai* (Yabe and Eguchi) (Fujino and Miyake, 1969), both hosts being ahermatypic corals. The mandible of *Ctenopontonia* shows a remarkable resemblance to that of another coral associated genus also found on hermatypic corals, *Fennera* (Holthuis, 1951). In this genus, the molar process of the mandible also shows very marked reduction in size and the incisor process is enlarged, broadened, with a much enlarged outer tooth and numerous smaller teeth along the distal margin.

***Ctenopontonia cyphastreophila* new species**
(Figures 1-6)

Material examined.—1 ♂, 1 ovigerous ♀. Eniwetok Atoll, Marshall Is., 5-15 m, coll. D. Devaney and J. E. N. Veron, 13 December 1976.

Description.—**FEMALE HOLOTYPE**. A small pontoniine shrimp with strongly compressed body form. The carapace is smooth with a short broadly triangular rostrum, that reaches almost to the distal border of intermediate segment of the antennular peduncle. The dorsal and ventral carinae are absent, the lateral carinae are slightly raised, convex and without teeth. The central part of the rostrum is distinctly depressed. The tip of the rostrum is acute and upturned. The orbit is well developed with a carinate edge bearing 23 similar slender, acute teeth on the dorsal and lateral margins. The hepatic spine is absent and distinct supraorbital and antennal spines are also lacking. A deep notch is present in the antero-lateral part of the carapace and the pterygostomial region is strongly produced as an

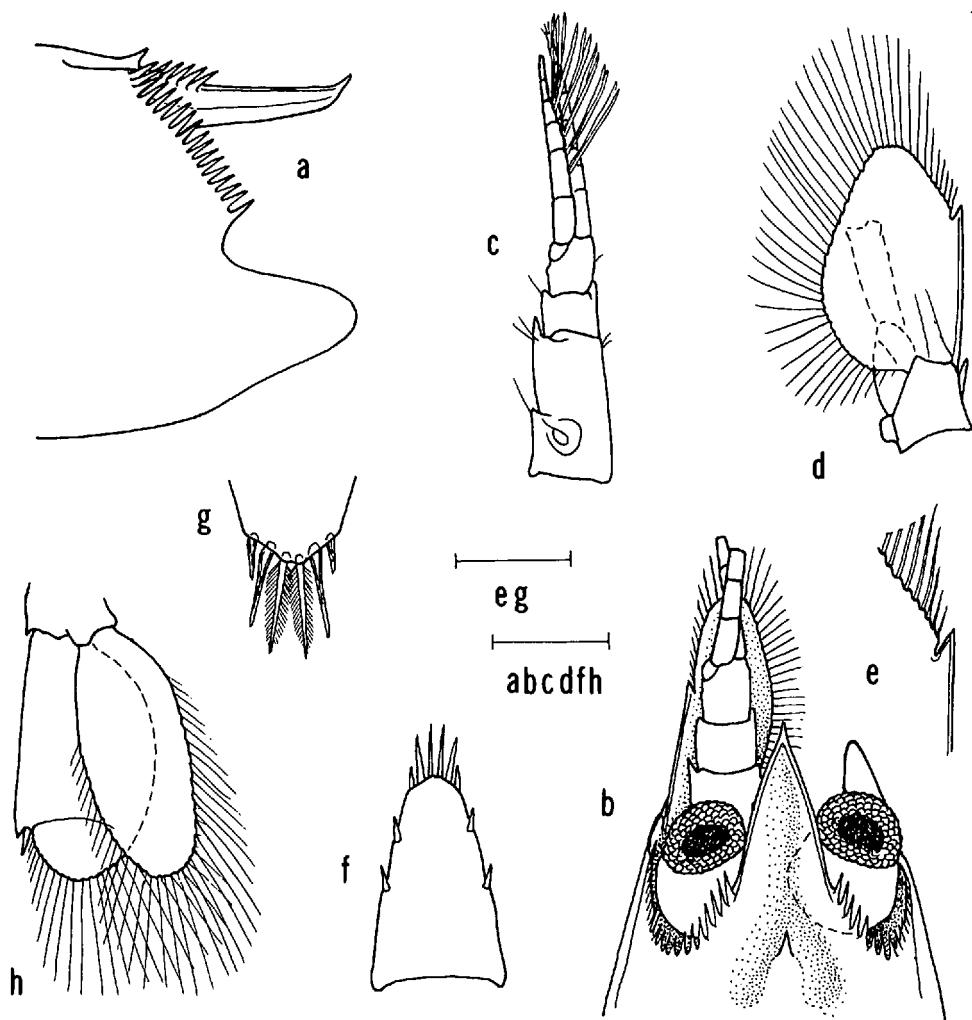


Figure 2. *Ctenopontonia cyphastreophila*, holotype. A, anterior carapace and rostrum, lateral; B, anterior carapace, eye and antennal peduncles, dorsal; C, antennule; D, antenna; E, disto-lateral spine of scaphocerite; F, telson; G, posterior telson spines; H, uropod.

elongated narrow lobe. A distinct medial dorsal epigastric spine is present just posteriorly to the margin of the orbits. The posterior margin of the branchiostegite is broadly rounded.

The abdominal segments are smooth. The third segment is not produced posteriorly. The fifth segment is subequal to the length of the sixth, which is twice as long as deep. The postero-lateral angle is broadly acute and the postero-ventral angle is acute and strongly produced. The pleura of the first three segments are greatly enlarged and broadly rounded. The fourth is also large and rounded and the fifth also rounded but comparatively small.

The telson is about 1.6 times the length of the sixth abdominal segment and 1.5 times longer than wide. The proximal width is about 2.6 times the width at the bases of the lateral posterior spines. The lateral margins are almost straight with well developed marginal dorsal spines at 0.46 and 0.72 of the telson length. The

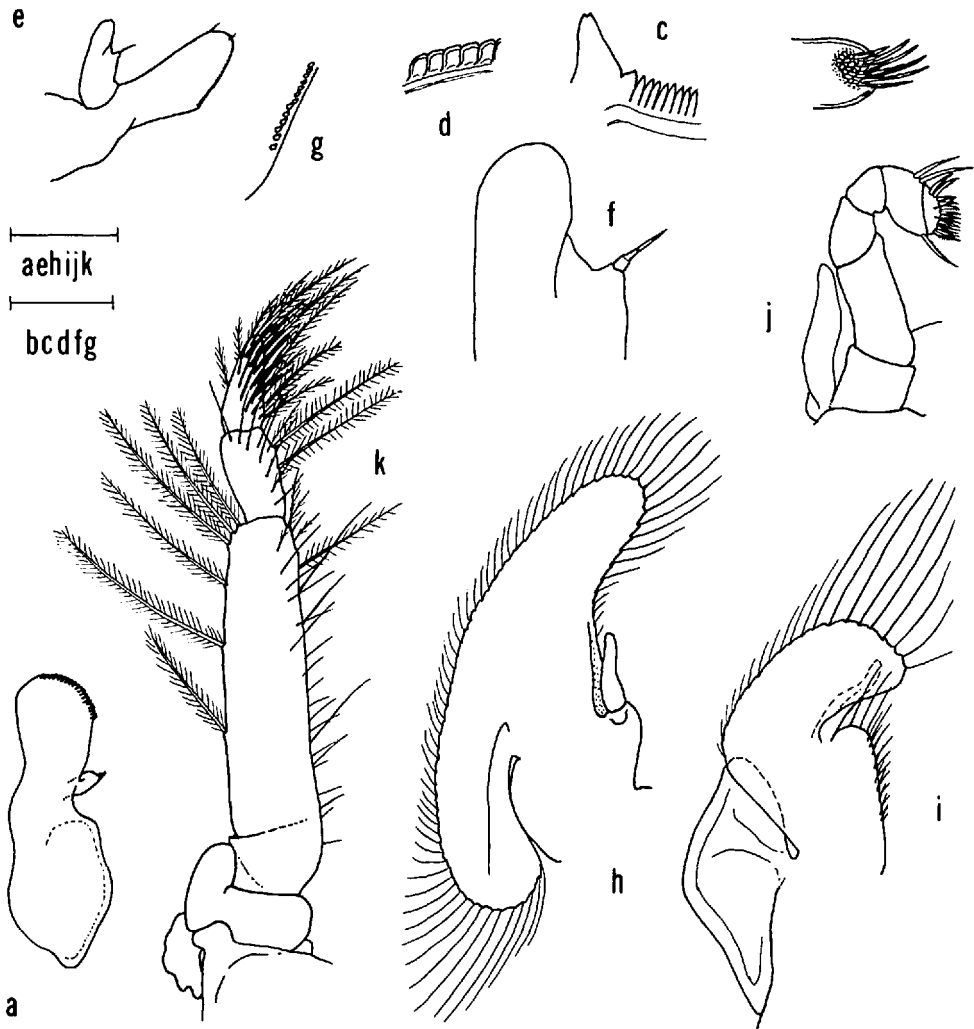


Figure 3. *Ctenopontonia cyphastreophila* new genus, new species. A, mandible; B, molar process; C, teeth of left incisor process; D, teeth of right incisor process; E, maxillula; F, palp of maxillula; G, medial edge of upper lacinia of maxillula; H, maxilla; I, first maxilliped; J, second maxilliped; K, third maxilliped.

posterior margin is obtusely angled, with three pairs of spines. The intermediate spines are slender, slightly swollen proximally, about 2.5 times the length of the lateral spines. The submedian spines are more slender, not swollen proximally and finely plumose medially and laterally.

The eyes are well developed with a hemispherical cornea. The podophthalmite is short and stout, slightly greater in width than the diameter of the cornea. No accessory pigment spot is discernible.

The antennulae are reduced. The antennular peduncle exceeds the tip of the rostrum by the distal segment. The proximal segment is about 1.75 times longer than broad, scarcely tapering distally and with a slender acute disto-lateral tooth. The stylocerite is greatly reduced, with a small acute tip at about 0.45 of the segment length. The statocyst is normally developed but without a statolith. The

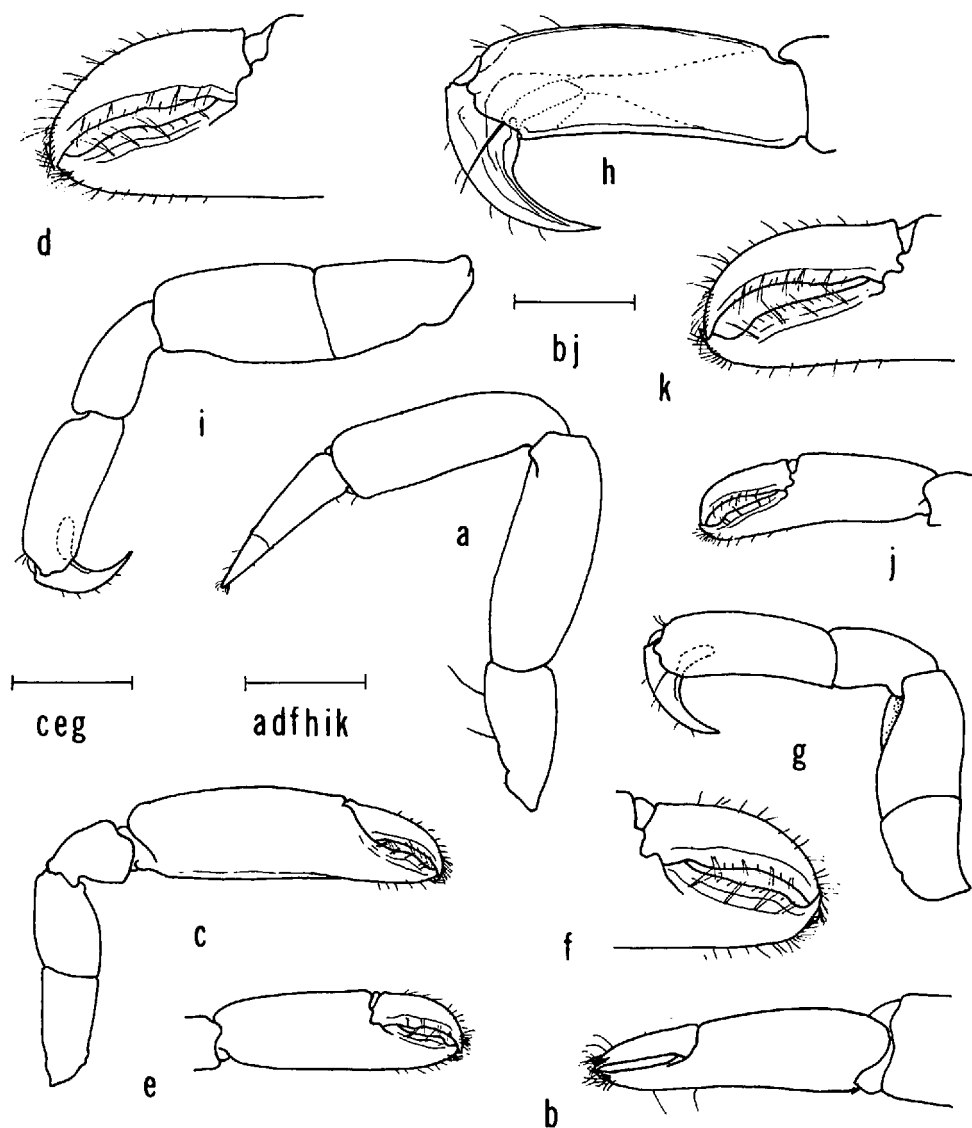


Figure 4. *Ctenopontonia cyphastreophila* new genus, new species. A, first pereiopod; B, chela of first pereiopod; C, major second pereiopod; D, fingers of major chela; E, minor second pereiopod; F, fingers of minor second pereiopod; G, third pereiopod; H, propod and dactyl of third pereiopod; I, fifth pereiopod. Male allotype: J, chela of second pereiopod; K, fingers of chela of second pereiopod.

medial margin is straight, without a ventral tooth. The intermediate segment is short and broad, about 1.3 times wider than long, without distinct medial or lateral lobes. The distal segment is about 1.2 times longer than wide, and distinctly narrower than the intermediate segment. The upper flagellum is very short and biramus. The stouter ramus consists of four segments only and all are fused with the more slender ramus which consists of four fused and two slender free segments. Six groups of aesthetascs are present. The lower flagellum is also reduced, with seven segments, and slightly exceeds the longer ramus of the upper flagellum.

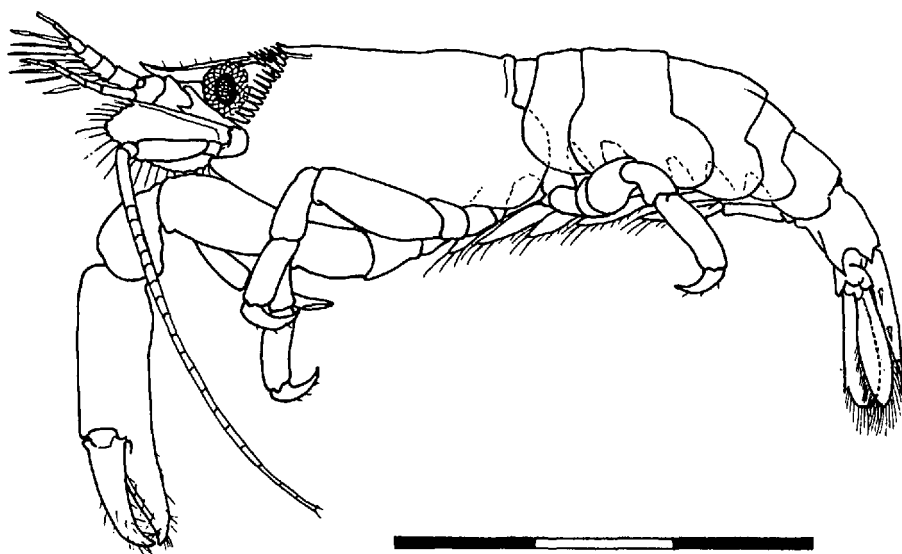


Figure 5. *Ctenopontonia cyphastreophila* new genus, new species. Male allotype.

The antenna has a short stout basicerite with a rounded lateral lobe. The car-pocerite reaches almost to the end of the antennular peduncle, and is almost four times longer than wide. The flagellum is short, about 1.3 times the post-orbital carapace length. The scaphocerite is large, extending well beyond the antennular peduncle. The lateral border is straight, with a short robust acute disto-lateral tooth. The lamina is broad, 1.6 times longer than wide, with the broadest portion at about one third of the length, and tapering distally to a strongly produced anterior portion that extends beyond the antero-lateral spine by 0.3 of the length of the lamina. The plumose marginal setae of the lamina are particularly long and oriented at right angles to the border. The protuberance of the antennal gland is large and blunt.

The epistome is normal, compressed with a carinate antero-ventral border. The mandibles are small and without palps. The corpus is short and stout, about 1.5 times longer than broad. The molar process is greatly reduced, short, subcylindrical, distally rounded, without any teeth, but with a small area of tessellate setae merging into a small tuft of short simple setae. The molar processes appear similar on each side. The incisor processes are large and scoop shaped, markedly angled in relation to the corpus. The distal border is almost straight with a large tooth anteriorly. The dentition on the cutting edge of the two incisor processes is different. On the left side there is a row of many slender acute spines and on the right, a lesser number of shorter, stout blunt teeth. The palp of the maxillula is feebly bilobed, the smaller lower lobe bearing a single short simple seta. The upper lacinia is elongated, about twice as long as broad. The medial border is straight, devoid of setae, but with a single row of small acute tubercles. A couple of short setae are present distally. No lower lacinia could be located. The maxilla has a short slender subcylindrical palp, devoid of setae. The basal and coxal endites are completely absent. The scaphognathite is well developed, about 2.75 times longer than wide, with large anterior and posterior lobes. All maxillipeds are completely without flagellate exopods. The first maxilliped has a subcylindrical, non-setose palp, slightly longer than that of the maxilla. The basal and

coxal endites are much reduced in size, completely fused, and only very sparsely setose. The distal margin is rounded and barely exceeds the base of the palp. The caridean lobe is well developed, curved medially in front of the anterior end of the basal endite, with long setae along its anterior aspect. A large irregular epipod is present, partly attached to the body wall. The second maxilliped has a very small dactylar segment, about 3.1 times longer than wide, with a strongly convex medial margin bearing rows of stout coarsely denticulate spines. The propod is comparatively large, with two large spines on the antero-medial margin and one on the disto-medial angle. The carpus, merus, ischio-basis and coxa present no special features. The epipod is elongated and narrow, reaching to the proximal end of the merus, and without a podobranch. The third maxillipeds are small, moderately robust and extend anteriorly to about the level of the anterior border of the merocerite. The ischio-merus is almost completely fused to the basis, the separation being indicated laterally but not medially. The whole antepenultimate segment is about 4.3 times longer than wide, feebly tapering distally so that the distal width is about 0.7 of the proximal width. The medial margin is sparsely setose with short simple setae. The lateral margin bears a few long plumose setae. The antepenultimate segment is about 1.6 times longer than wide, and slightly shorter than the terminal segment, the two segments together equal to half the length of the antepenultimate segment. The distal segments bear numerous slender simple setae, some long plumose setae and also some robust denticulate spines. The medial border of the coxa is rounded and a small oval epipod is present laterally. A vestigial foliaceous arthrobranch is also present.

The thoracic sternites are narrow and unarmed.

The first pereopods are moderately robust, the distal end of the merus reaching approximately to the middle of the carpocerite. The palm of the chela is subcylindrical proximally, tapering and slightly compressed distally, about 2.4 times longer than deep. The fingers are compressed, tapering with feebly hooked tips distally, equal to about half the length of the palm. There are no sharp cutting edges on the fingers. The carpus is stout, about 3.2 times longer than wide, subcylindrical, slightly narrower proximally than distally and with very poorly developed cleaning setae. The merus is also robust, subequal to the length of the carpus, and 2.7 times longer than the subcentral width. The ischium is equal to about 0.6 of the meral length and tapers strongly proximally. The basis and coxa are robust, without special features.

The second pereopods are small, stout, subequal, and similar. The larger has the palm subcylindrical, smooth, about 2.5 times longer than wide and feebly compressed. The fingers are more strongly compressed, curved, tapering to hooked tips, equal to about half the palm length. The cutting edges are sharp but without distinct teeth. The distal part of the cutting edge of the fixed fingers bears a distinct concavity, with a low convex portion proximally. The outer and cutting edges bear numerous short setae. The minor chela is similar, with the palm about 2.1 times longer than deep, 1.7 times the length of the fingers and 1.4 times the palm of the major chela. The fingers are similar to those of the larger chela but the distal concavity on the fixed finger is more marked. The carpus is short and stout, about 0.3 of the palm length, expanded distally and unarmed. The merus and ischium are subequal, equal to half the palm length and unarmed. The merus is 1.7 times longer than the distal width. The basis and coxa are robust, short and without special features.

The ambulatory pereopods are short and stout. The third pereopod exceeds the basicerite by the length of the dactylus. The dactylus is robust, simple and

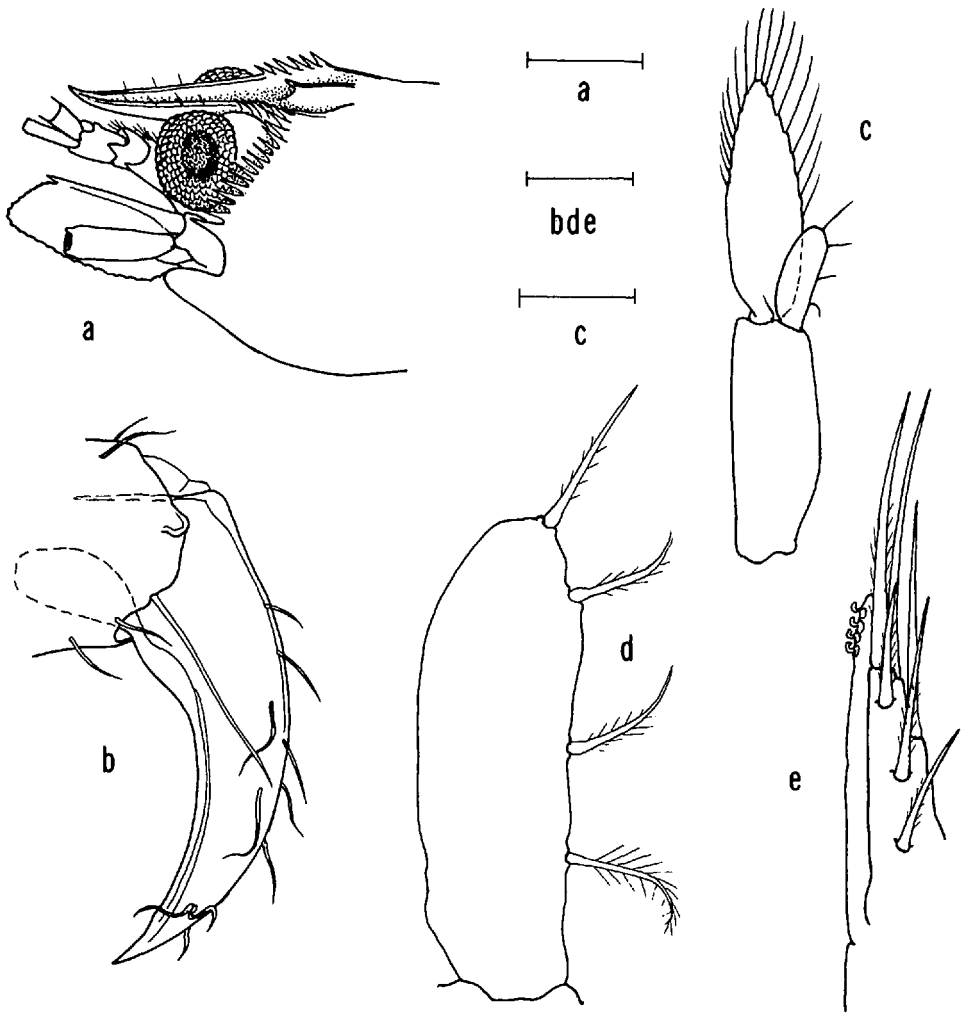


Figure 6. *Ctenopontonia cyphastreophila*, male allotype. A, anterior carapace and rostrum, eye and antennal peduncles, dorso-lateral view; B, dactyl of ambulatory pereopod; C, first pleopod; D, endopod of first pleopod; E, appendix interna and appendix masculina of second pleopod.

strongly curved, about 2.4 times longer than the width across its base, and 0.6 of the propod length. The ventral border is sharp and unarmed. A pair of short sensory setae are present disto-laterally and a few short slender setae are scattered along the dorsal aspect. The unguis is not distinctly demarcated from the corpus. A particularly large basal plaque is present. The propod is 3.2 times longer than broad, slightly bowed, of almost uniform width and ventrally unarmed. The disto-ventral border bears a single slender seta only. The corpus is also unarmed, 1.75 times as long as wide, and 0.8 of the propod length. The merus is markedly stouter than the carpus, 1.5 times longer than broad, and equal to 0.7 the propod length. The basis and coxa are normal. The fourth and fifth pereopods are similar. In the fifth the propod is slightly shorter and stouter, and the merus and ischium are distinctly longer and broader.

The branchial formula consists of the following gills:

	Maxillipeds			Pereiopods				
	I	II	III	I	II	III	IV	V
Pleurobranch	—	—	—	1	1	1	1	1
Arthrobranch	—	—	r	—	—	—	—	—
Podobranch	—	—	—	—	—	—	—	—
Mastigobranch	—	—	—	—	—	—	—	—
Exopod	—*	—	—	—	—	—	—	—

* Flagellum absent, caridean lobe present. r = rudimentary.

The pleopods show no special features. The peduncles are elongated and the rami expanded. The second to fifth endopods bear a small appendix interna.

The uropods extend well beyond the tip of the telson. The protopodite is unarmed postero-laterally. The exopod is broad, about 1.8 times longer than wide, with a straight lateral border ending in a short acute tooth, with a large mobile spine medially. The endopod is more slender and scarcely exceeds the tip of the exopod, about 2.3 times longer than wide.

The ova are relatively large and few in number, but many have apparently hatched.

MALE. Generally similar to the female but considerably smaller, with a more subcylindrical and less strongly compressed body form. The rostrum is similar to the female's, but the tip is less markedly upturned. The orbital spinulation is well developed but spines are slightly less numerous than in the female, about 20 on each side. The antero-lateral lobe of the carapace is much less produced.

The antennae and mouthparts show no significant differences from the female. No lower lacinia could be found on the maxillula.

Only one second pereiopod is preserved. The chela is smaller than those of the female, being slightly shorter than the length of the minor chela. The palm is about twice as long as deep, increasing in width a little distally. The fingers are equal to about 0.7 of the palm length, and are similar to those of the female, without teeth and with a marked concavity distally on the cutting edge of the fixed finger. The ambulatory pereiopods are also similar to those of the female.

The first pleopod has a small endopod, about three times longer than wide, rounded distally and with four short feebly setulose setae on the medial border. The second pleopod has a short appendix masculina on the endopod, which is distinctly exceeded by the appendix interna. The appendix masculina bears six spines, a long slender terminal spine, a similar subterminal lateral spine and a distal lateral spine, with a row of three shorter spines ventrally.

Types.—The female specimen is designated as the holotype and the male as allotype. Both specimens are deposited in the collections of the Bishop Museum, Hawaii, registration numbers-S8538, S8539.

Measurements (In mm).—Total body length (ca.) ♀—10.8, ♂—6.3; carapace and rostrum, ♀—3.3, ♂—0.7; postorbital carapace, ♀—2.5, ♂—0.6; chela of second pereiopod, ♀—2.6:2.05, ♂—2.0; length of ovum 0.65.

Coloration.—Female: body mainly translucent, with easily visible ovary, with two pair of white patches on the side of the carapace, the smaller anterior pair just posterior to the peri-orbital comb of spines and the larger more posteriorly. The abdomen bears three round white spots along the dorsal midline, with five white patches along the ventral aspect. The pleura show white patches on the first to

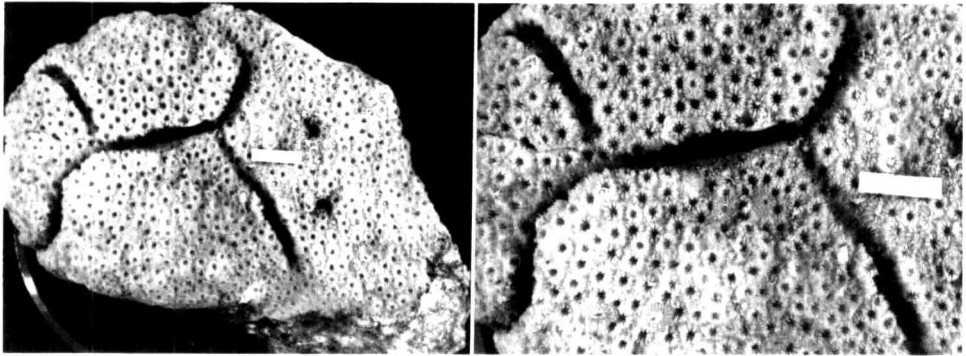


Figure 7. *Cyphastrea microphthalma* (Lam.), showing grooves caused by *Ctenopontonia cyphastreophila* new genus, new species. White scale represents 2 cm.

sixth segments. The second pereopods show a white patch at the tip of the fixed finger and at the hinge of the fingers, at the proximal end of the palm and at the proximal end of the carpus. The antennal and ambulatory pereopods are colorless.

Male similar to female but less heavily marked with white. Six white spots present along the ventral aspect of the body and with white patches at the joints of the ambulatory pereopods.

Host.—*Cyphastrea microphthalma* (Lam.), Faliidae, Scleractinea).

Depth.—Probably 5–15 m.

Habitat.—The pair of shrimps were found together in a deep narrow groove on the upper surface of the coral host (Fig. 7). The grooves formed a system consisting of a deep central channel with a pair of less deep grooves radiating from each end. The central depression is about 10 mm deep and about 2.5 mm wide. The peripheral branches have shallower depressions.

DISCUSSION

The discovery of *Ctenopontonia cyphastreophila* is of particular interest as it is only remotely related to most of the other coral-associated pontoniine shrimps that have been reported from the Indo-West Pacific region. These genera are mainly associated with the branching corals of the families Acroporidae and Pocilloporidae, and all have normally developed, or often very well developed exopods on the three maxillipeds. Exceptions to this are the genus *Pontonides*, of which two species, *P. maldivensis* (Borr.) and *P. unciger* Calman have been reported in association with the ahermatypic corals *Dendrophyllia micracantha* (Ehrenberg) and *D. ijimae* Yabe and Eguchi (Bruce, 1977; Fujino and Miyake, 1969), and *Paratypton siebenrocki* Balss, which inhabits almost completely enclosed cysts in corals of the genus *Acropora* (Bruce, 1969).

Paratypton is a much more highly specialized genus than *Ctenopontonia* in which all processes of the carapace, including even the rostrum, have become obsolete. *Ctenopontonia*, in this respect, represents an intermediate stage. The mandibles in the two genera are remarkably similar, with the expanded incisor processes with numerous minute teeth, and in the reduced size of the molar processes. The upper lacinia of the maxillula is elongated with numerous small distal teeth in both species, although this is most marked in *Ctenopontonia*. In *Paratypton* the lower lacinia is well developed. The maxillae are almost iden-

tical in the two genera. The exopod of the first maxilliped has a well developed, broad multisetose flagellum in *Paratypton*, but this is totally absent in *Ctenopontonia*. The second maxillipeds are quite without exopods in both species, but an elongated epipod is present in *Ctenopontonia* and not in *Paratypton*. In the latter, the endopods are very robust and form an operculum in conjunction with a large triangular median process of the second thoracic sternite, which is not present in *Ctenopontonia*. The third maxillipeds have generally similar endopods, but *Ctenopontonia* has a small but distinct epipod and a rudimentary arthrobranch, both of which are completely lacking in *Paratypton*.

No other pontoniine shrimps have the orbital margin fringed with a row of spines as found in *Ctenopontonia*. The closest resemblance is found in *Fennera chacei* Holthuis, an associate of pocilloporid corals. In this species several post-antennal spines are present along the lower lateral rim of the orbit, up to four in number (Bruce, 1965), but these are really ventral to the orbital rim.

No pontoniine shrimps are known in which the lower lacinia of the maxillula is lacking, but in some species, such as *Fennera chacei* this segment is quite small (Holthuis, 1951), and it is assumed that these were lost in the course of dissection. Careful search was made but they could not be located in either male or female specimen, so it is probable that they are rather small.

No pontoniine shrimps have been previously found in association with *Cyphastrea*. Search for further specimens of *C. cyphastreophila* on *Cyphastrea* at Heron Island failed to provide any further examples. The coral colonies were, however, deeply channeled and numerous examples of *Alpheus obesomanus* Dana were found in these depressions, thus occupying a rather similar niche to, and possibly excluding *C. cyphastreophila*.

The only other pontoniine shrimps so far reported (Bruce, 1977) as associates of faviid corals are: *Periclimenes goniopora* Bruce, on *Goniopora stokesi* M. Edw. and Haime, *Hamopontonia corallicola* Bruce, on *Goniopora stokesi* M. Edw. and Haime, *Metapontonia fungiacola* Bruce, on *Goniastrea pectinata* (Ehrenberg), and *Hydnophora microconus* Lam.

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